

A NEW SPECIES OF LARGE, GREEN TREE FROG FROM NORTHERN WESTERN AUSTRALIA

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Summary

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A new species of large, green tree frog of the genus *Litoria* is described from the vicinity of Kununurra in northern Western Australia. Details of external morphology are supplemented by a study of radiographic plates. The new species is most closely related to *L. caerulea* and lives sympatrically with it.

Introduction

The green hylid tree frogs of Australia range in size from the predominantly Papuan *Litoria infrafrenata* (Günther), attaining a maximum size of 135 mm, to small and delicate species such as *L. fallax* (Peters) and *L. bicolor* (Gray), adult as small as 23 mm. The conspicuous nature of these green animals renders them particularly highly disposed to being collected by herpetologists, leading to the reasonable assumption that this group of Australian frogs should be well established and taxonomically stable.

In the course of a visit to northern Western Australia in February 1977, we collected representatives of an hitherto undescribed green hylid, readily distinguished by several features of its gross morphology, but with distinct affinities with *L. caerulea*. Subsequently additional preserved specimens were provided by the Western Australian Museum (WAM). Here we describe this new species, compare it with *L. caerulea* and discuss the significance of this discovery.

Methods of measurements follow Tyler (1968). X-ray illustrations were obtained by the Rank Xerography process employing positive mode. Direct comparisons were made between X-ray prints of the holotype of the new species and X-ray prints and dried osteological material of *L. caerulea*.

Litoria splendida sp. nov.

FIGS 1, 3, 4

Holotype: WAM R56840. An adult female collected at Lake Argyle Tourist Village, Kimberley Division, northern Western Australia, by a joint University of Adelaide and University of Melbourne field party on 22.ii.1977.

Definition: The characteristic features of this species are its very large size (males and females *ca* 100 mm S-V length); possession of a vast and bulbous gland on the entire dorsal surface of the head; relatively short and slightly webbed fingers with prominent terminal discs; brilliant green dorsal colouration bearing sulphur spots, and its orange flanks (Fig. 1).

Description of Holotype: Head considerably broader than long (HL/HW 0.85), its length equivalent to one-third of body length (HL/S-V 0.33). Entire dorsal cranial surface obscured by a dermal gland raised approximately 5 mm above surface. Snout not prominent, truncated when viewed from above and in profile. Nostrils more lateral than superior; their distance from end of snout considerably less than that from eye. Distance between eye and naris greater than internarial span (E-N/IN 1.18). Canthus rostralis slightly defined and gently rounded. Eye relatively inconspicuous, its diameter less than eye to naris distance. Tym-

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panum visible and inclined medially at 45° ; diameter equivalent to eye diameter.

Vomerine teeth on short, posteriorly directed, triangular elevations between and posterior to choanae. Tongue extremely broad.

Fingers short and equipped with broad lateral fringes; in decreasing order of length $3 > 4 > 2 > 1$. Webbing between fingers only basal. Terminal discs extremely broad and extending considerably beyond margin of lateral fringes. Subarticular and palmar tubercles prominent.

Hind limbs rather short (TL/S-V 0.48). Toes in decreasing order of length $4 > 5 = 3 > 2 > 1$. Webbing reaches half way up penultimate phalanx on 5 and base of penultimate phalanx of 4. Subarticular tubercles prominent. Very large oval inner and small rounded outer metatarsal tubercles.

In addition to cranial gland, skin modified in following ways: (1) poorly developed dermal ridge on posterior margin of forearm; (2) ventral surfaces of body and femora uniformly granular.

In preservative dorsal surface of head, body and portions of limbs hidden at rest in a living frog are dull slate blue. Dorsum of body liberally spotted with very small white areas. Dorsal surface of third and fourth fingers, and third, fourth and fifth toes, anterior and posterior surfaces of thighs and almost entire ventral surface very pale cream.

In life dorsum dark lime green bearing numerous small sulphur yellow spots, each of which has a dark border. First two fingers, first three toes, groin and back of thighs brilliant orange. Ventrally white, with pale green mandibular border.

This female specimen has a few very small pigmented ova and the oviducts are convoluted only posteriorly.

Dimensions of Holotype: S-V 100.7 mm; TL 48.0 mm; HL 33.4 mm; HW 39.2 mm; E-N 8.6 mm; IN 7.3 mm; E 7.7 mm; T 7.8 mm.

Variation

There are six paratypes all taken in northern W.A.: WAM R26818, Old Napier Downs Cave, Napier Downs, Napier Range. A. M. Douglas and G. W. Kendrick 8.vii.66; R44601-02, spillway at northern boundary of Lake Argyle, Western Australian Museum survey 11.ii.72 and 20.ii.72; R47231, Prince Regent River National Park, Western Australian Museum survey 17.vii.74; R56779, Kimbolton

Spring, Kimbolton Stn, W. H. Butler 26.vi.76; R56780 Drysdale River National Park, Western Australian Museum survey 13.viii.76.

The snout to vent length range is 90.2-106.3 mm; the largest of these is a female containing numerous small pigmented ova.

In their gross morphology the paratypes differ from the holotype only slightly. All exhibit an extremely prominent supraorbital gland, sometimes extending anteriorly beyond the anterior tip of the snout, and also overlapping the tympanum. The head is consistently broader than long (HL/HW 0.85-0.95), whilst the HL/S-V ratio is 0.32-0.37. Similarly the E-N/IN range is comparable to that of the holotype (1.00-1.23). The limbs are consistently rather short (TL/S-V 0.46-0.50).

All specimens exhibit numerous, small, white spots on the dorsum.

Comparison with other species

(a) External morphology

Within the Australo-Papuan region there are several large tree frogs that are predominantly green in life. Of the species restricted to New Guinea, *L. splendida* may be distinguished from *L. graminea* by its slightly broader head (HL/HW 0.85-0.95 in *L. splendida*; 0.90-1.03 in *L. graminea*), shorter hind limbs (TL/SV 0.46-0.50 in *L. splendida*; 0.56-0.60 in *L. graminea*), less extensively webbed fingers (approximately one-half webbed in *L. splendida* but reaching the discs of all fingers in *L. graminea*); *L. graminea* lacks the supraorbital gland of *L. splendida* and is probably smaller (males of *L. graminea* are only up to 65 mm in length).

Litoria infrafrenata is a predominantly Papuan species known in Australia only from the Cape York Peninsula in Queensland. Its size overlaps that of *L. splendida*, but it is a shallower bodied creature, always exhibiting a brilliant white mandibular stripe. The head is structurally quite different, tending to be flattened with a prominent and concave facial shelf. In contrast, *L. splendida* has a high head and the prominent supraorbital gland is totally lacking in the former species. The hind limbs of *L. splendida* are slightly shorter, TL/S-V 0.46-0.50 as opposed to 0.51-0.63 in *L. infrafrenata*.

Litoria splendida is most closely related to *L. caerulea* (Fig. 2) and occurs sympatrically with it. The size and general habitus of the two species are similar. They differ principally in



Fig. 1. Adult individual of *Litoria splendida*.



Fig. 2. Adult individual of *Litoria caerulea*.



Fig. 3. Distribution of *Litoria splendida* (solid circles) and the Australian portion of the geographic range of *L. caerulea* (stippled).

colouration, dermal gland development and in behaviour (see discussion). *L. caerulea* occupies a large area of the Australian continent (Fig. 3) and is somewhat variable in its colouration throughout its range. Central Australian individuals commonly have large white spots and patches on their bodies and are referred to *L. gilleni* by some authors (e.g. Cogger 1975). In the northern part of the Northern Territory and Western Australia (including the type locality of *L. splendida*), individuals are usually a pale yellowish green; elsewhere the dorsum ranges from dark green to olive. However, the distinctions between *L. splendida* and *L. caerulea* remain conspicuous. *L. caerulea* lacks the brilliant yellow markings found on the thigh, groin and hand of *L. splendida* and lacks the small sulphur spots commonly occurring in the new species. *L. caerulea* is otherwise unique amongst Australian hylids in exhibiting a parotoid gland but it lacks any comparable glandular tissue on the dorsum of the skull.

Osteological features of the two species are listed below.

(b) *Comparative osteology of L. splendida and L. caerulea*

Recognising that a close relationship exists between *L. splendida* and *L. caerulea* we undertook a detailed comparison of a number of osteological features: *L. splendida* is shown in Figure 4.

1. *Skull*

(a) Shape: the shape of the skull of *L. splendida* differs from that of *L. caerulea* in that it is narrower and less blunt.

(b) Nasals: the shape of the nasals and their relationship with the sphenethmoid are difficult to determine from X-ray photography. It is known that in *L. caerulea* the well-developed nasals are narrowly separated medially by the sphenethmoid with which they articulate and overlap extensively (Tyler & Davies¹).

(c) Frontoparietals: a supraorbital frontoparietal flange is present in both species, similar to that found in *L. infrafnata* (Davies in press) but in *L. caerulea* this is developed to a lesser extent than in *L. splendida* and *L. infrafnata*.

(d) Frontoparietal fontanelle: this is moderately sized and ovoid in both *L. splendida* and *L. caerulea*.

(e) Squamosals: the otic rami of the squamosals do not overlap the crista parotica in either species.

(f) Otoccipital region: the lateral extremities of this region are cartilaginous in both species.

(g) Pterygoid: the well developed pterygoids do not articulate with the otic capsule in either species.

(h) Quadratojugal: the quadratojugal is well developed in both *L. splendida* and *L. caerulea*.

(i) Prevomers: the alae of the prevomers are developed to differing degrees in *L. splendida* and *L. caerulea*. Those of *L. splendida* are elongate and extend almost to the level of the palatal shelf of the maxillaries, whereas those of *L. caerulea* are short and barely reach the level of the extremities of the supraorbital frontoparietal flange.

(j) Palatine processes of premaxillaries: in *L. caerulea*, these processes abut along their medial extremities, whilst in *L. splendida* there is no medial articulation.

2. *Vertebral column*

(a) Sacral diapophyses: the sacral diapophyses are poorly expanded in *L. splendida* and moderately expanded in *L. caerulea*.

(b) Iliia: the ilia extend anteriorly to the sacral diapophyses in both species.

(c) Transverse processes of posterior presacral vertebrae: in *L. splendida* these are equal and

¹ Tyler, M. J. & Davies, M. (in manuscript) Species group within the Australopapuan hylid frog genus *Litoria* Tschudi.

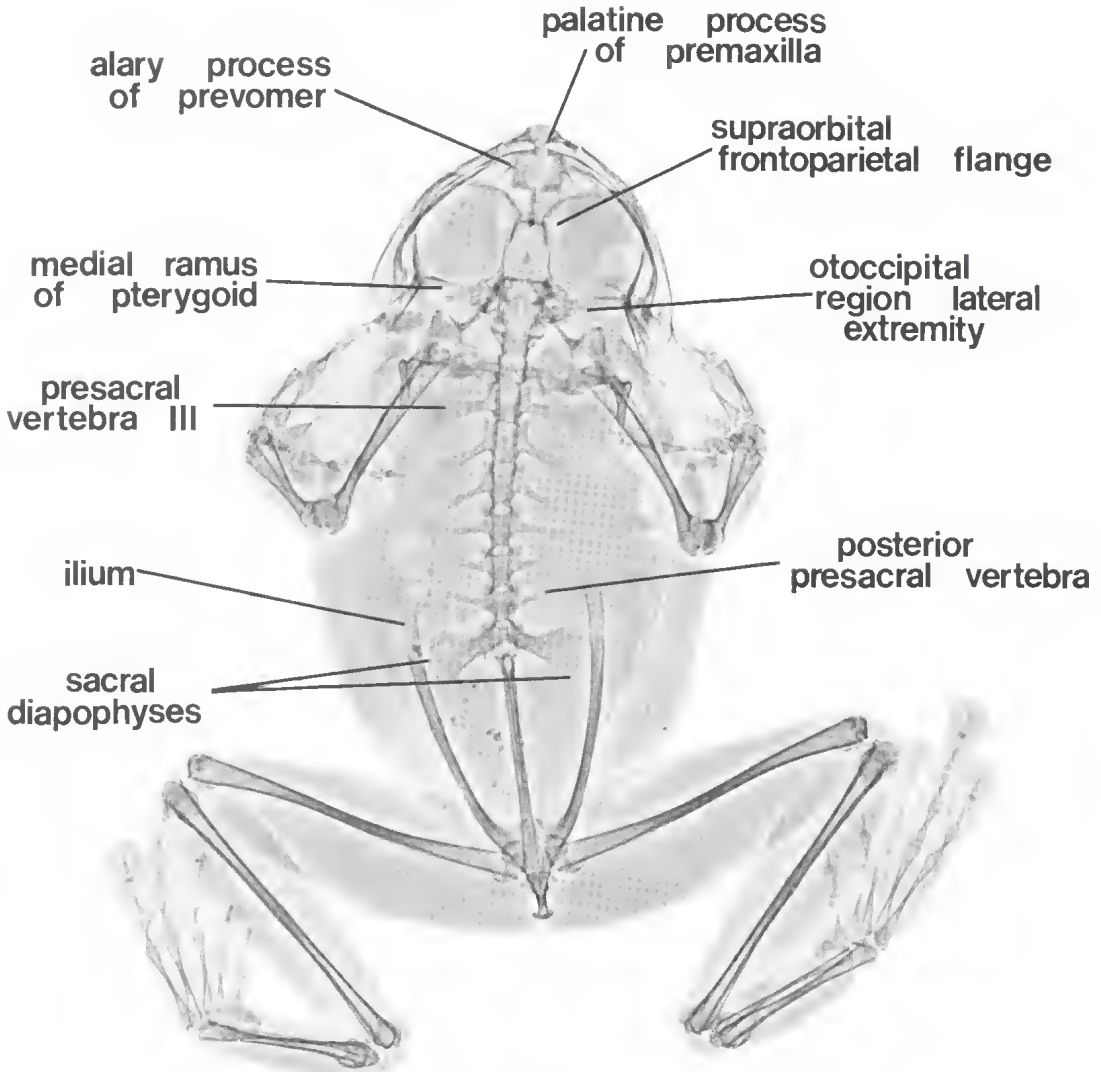


Fig. 4. X-ray print of *Litoria splendida* (Holotype: WAM R56640).

directed slightly anteriorly, whereas in *L. caerulea* the processes are subequal and are directed anteriorly at a slightly more acute angle.

(d) Transverse processes of presacral vertebrae III: these are equal in width to the sacral diapophyses in *L. caerulea*, but narrower than the width of the sacral diapophyses in *L. splendida*.

Habitat

The specimens collected by us were taken in artificial situations such as upon bitumen roads at night following torrential rains. How-

ever it is clear that such a large frog would require a summer retreat to avoid very high temperatures. Two of the paratypes were collected within caves: R26818 at Old Napier Downs Cave, and R44600 at a site 8 km N of Lake Argyle. Similarly R27231 was taken in a ledge in a sandstone gorge.

Litoria splendida is evidently adept at surviving in areas of low rainfall, so paralleling the habits of *L. caerulea*. In the vicinity of the type locality the vegetation is predominantly scattered scrub of sparse, low-growing eucalypts with pockets of *Pandanus*. Soils range there from sand to clay. The area receives an average rainfall of 50–75 mm from

monsoonal rains between December and March.

Litoria splendida is commensal with man and the species is well known to inhabitants at Lake Argyle and at Kununurra. In common with *L. caerulea* it inhabits bathrooms, toilets and other such sites where there is water. The holotype was taken at night on the floor of an ablution block.

Distribution

As demonstrated in Figure 3 all of the localities at which this species has been taken occur in the extreme northwestern and peripheral portion of Australia.

Discussion

As indicated above, the new species is phylogenetically very closely related to *L. caerulea*. The supraerianial gland seems to represent hypertrophied parotoid glands that have increased in extent as well as mass, thus becoming a single unified gland.

In captivity, behavioural differences between the species have been noted. Whereas *L. caerulea* tends to become a rather sedentary creature in captivity, *L. splendida* after three

months is exceptionally active and avoids attempts to handle it.

In finding such a large and spectacular creature in 1977, we are led to the conclusion that the extent of sampling of the Australian lower vertebrate fauna is highly deficient.

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